FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 82-37

3430 Evaluation
October 15, 1982

EVALUATION OF BLUFF CREEK AREA AND LIGHTNING SALE, ORLEANS RANGER DISTRICT, SIX RIVERS NATIONAL FOREST

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ABSTRACT

Two areas on the Orleans District were examined for pest conditions. A Douglas-fir stand near Bluff Creek was reevaluated for black stain root disease; the initial evaluation was done in the fall of 1981. Although numerous root disease centers were identified in this saw±imber-size stand of trees, Douglas-fir is expected to remain a primary component. Management alternatives that give consideration to the constraints on the area are discussed.

An evaluation in the Lightning Sale area was also conducted. A portion of this mixed conifer stand experienced windthrow during storms in the fall of 1981. The root systems of these windthrown trees were extensively decayed by Armillariella mellea, but nearby standing trees had no crown symptoms indicating root problems. The remainder of the stand had various levels of stocking, with some portions understocked and some overstocked for the site because of past logging activities. A range of management alternatives are addressed that have a variety of impacts on future site productivity.

INTRODUCTION

Two evaluations were conducted on the Orleans Ranger District: one in the Bluff Creek area and the second in the Lightning Sale. Both of these evaluations were in response to District concerns about root disease and apparent increasing mortality in the two areas. The objectives of the two evaluations were to determine the cause and extent of mortality and to develop management alternatives that included some consideration of management constraints.

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BLUFF CREEK

On July 28, 1982 we met with Tom Bouse and Andy Colaninno from the Orleans Ranger District and examined a timber stand near McFarland Gulch above the Bluff Creek Station (T.10N., R.4E., section 25). This approximately 40-acre Douglas-fir stand had been previously examined by members of the FPM Staff (see 3430 memorandum to Forest Supervisor, Six Rivers National Forest, dated September 14, 1981) who identified black stain root disease (caused by Ceratocystis wageneri) in the stand and provided management alternatives.

The stand is located in an area with a visual quality objective of retention; this restricts activities to those not noticeable to the casual observer. It is on a 30 to 70 percent slope, restricting any logging activity to cable or aerial (helicopter or balloon) systems. Access for harvesting is complicated because of adjacent private ownerships. These constraints, in concert with the current poor market conditions, are anticipated to make any timber sale at the present time in this stand a deficit sale. Other possibilities were then considered in the present development of management alternatives.

OBSERVATIONS

The stand is primarily composed of sawtimber-sized Douglas-fir with smaller components of incense-cedar, ponderosa pine, and tanoak. On one side of the stand is a young-growth Douglas-fir stand and on the other side is an older, but still vigorous, stand of Douglas-fir that abuts a proposed Research Natural Area (RNA). District personnel have not observed any dead or dying Douglas-firs in these adjacent stands, although dead and dying Douglas-fir have been seen in the RNA.

Several suspected black stain root disease centers were confirmed and additional centers identified by the presence of the typical dark staining of the xylem. These centers had dead Douglas-firs, as well as trees with crowns that were sparse and chlorotic. Most centers involved several trees, but none involved more than 10 trees. Some centers will coalesce in the next few years. Infected trees were more readily identifiable on the harsher sites where serpentine soils occurred.

Some of the trees with declining crowns had overgrown larval mines of the flatheaded borer, Melanophila drummondi, in the lower boles. Although the trees were still vigorous enough to callus over the borer larvae, the disruption of the cambial tissue caused by the larval mines and callus tissue is probably further reducing the vigor of the trees.

MANAGEMENT ALTERNATIVES

Management alternatives have been revised and updated from the previous evaluation to take into consideration the District's current management goals and objectives.

1. No Action. Mortality of Douglas-firs will continue in root disease centers in the infested stand. These centers are expected to enlarge with time, although they may be limited in expansion by non-hosts or by other unknown reasons. New centers may be initiated, but the likelihood or number of these occurrences is unknown. The amount of mortality is expected to continue at about its present level. Douglas-fir are expected, however, to continue to occupy much of the hillside.

2. Salvage. According to District personnel an independent salvage operation in this stand can not be economically justified. It might be feasible to remove some of the dead and dying trees in conjunction with a green sale in adjoining stands on the ridge. A commercial thinning or harvest cut in an adjacent stand would provide access to the upper reaches of the infested stand and possibly provide sufficient volume to economically justify logging activities. This would allow cable systems to reach the dead and dying trees in the upper parts of the infested stand. Implementation of this alternative will have no effect on the progress of the disease in the stand. Mortality will continue at about its present level and, on average, infection center size will increase radially about 4 to 12 feet per year. New infection centers may become established, but their number and possible locations are unknown.

3. Sanitation/Salvage. This operation will have some similarity to Alternative 2 in that it could be done in conjunction with a commerical thinning in adjacent stands. In addition to removing dead and dying trees, infected trees with minor or no crown symptoms could be identified around disease centers and could then be removed. This might increase the economic benefits of the sale, as well as capture green volume that will be expected to die over the next several years. The need for future salvage entries will also be reduced. The amount of visible mortality will decline for several years because of the removal of infected trees. The underground spread of the fungus, however, will not be affected because of the extension of the fungus in the root systems of trees beyond those trees with stain at the root collar. New mortality will occur as these trees become more severely infected. New infection centers may become established, but their number and possible locations are unknown.

4. Buffer Strip. In certain situations, it has been suggested that the radial spread of black stain infection centers can be limited, and possibly halted, by the felling of all hosts in a strip 75 feet wide around the outer limits of such centers. The intent of such a buffer is to prevent the spread of C. wageneri via root contact to adjoining stands. Previous examination and mapping by Tom Bouse indicated that the number and location of suspected disease centers at Bluff Creek is quite extensive. Attempting to encircle each center will result in considerable overlap of strips and result in most of the stand being either in a strip or within a buffer. To simplify implementation the entire 40-acre stand would be considered an infection center and would be separated from surrounding stands by a 75 feet wide strip devoid of Douglas-fir. There is enough unknown and incomplete information about the fungus and its means of transmission in Douglas-fir that the effectiveness of this treatment in this situation can be questioned. Even though underground spread of the fungus might be halted the number of trees lost when creating the buffer strip might be greater than the number lost to the disease, at least in the short-term. The loss of

these buffer trees would be more visible to the public because of their sudden removal. Also, the existence of the disease in surrounding stands is unknown, although probable. Mortality of Douglas-fir would continue unabated within the stand. The root-to-root spread of the fungus out of the stand to surrounding uninfected trees will be halted. New infection centers may be established, but their number and possible locations are unknown.

5. Buffer Strip/Species Conversion. As in Alternative 4 a 75 feet wide buffer strip beyond the last visibly infected tree will be created around each infection center. All Douglas-fir in the infection centers will also be removed. This will likely result in a virtual clearcut of the stand. Ponderosa pine and incense-cedar can be retained, if desired. After tree removal the site should be regenerated with either ponderosa pine, incense-cedar, or both. The benefits of this treatment are to return the site to a productive stand, capture all possible future salvage while green, and remove the host so that the fungus will die out on the site permitting regeneration of Douglas-fir in the future. The drawbacks include impacts on visual, soil, and watershed resources; logging difficulties; economic considerations; and other concerns that the District may have.

LIGHTNING SALE

On July 29 we visited the Lightning Sale area (T.12N., R.5E., section 5) with Bouse and Colaninno. This is a mixed conifer stand, primarily Douglas-fir, white fir, ponderosa pine, sugar pine, and black oak, that was last logged in 1973. The resulting stand has a wide range of age and size classes with various levels of stocking. Openings with some natural regeneration were observed in the stand. These were interspersed with dense aggregations of sapling- and pole-sized trees and some overstory individuals. Much of the overstory had crowns in poor condition. Logging damage was extensive along the old skid roads.

There was concern because of the windthrow of numerous trees last fall and the abundance of honey fungus (Armillariella mellea) mushrooms in the area of windthrow. This concern reflected around the expected future condition of the stand if windthrow continues and other mortality should occur.

OBSERVATIONS

The windthrow was located in one area of the stand and involved sugar pine, Douglas-fir, and white fir trees. All of the windthrown trees had been alive at the time of uprooting and the boles were still green when examined. None of the surrounding standing trees had crown symptoms indicative of any root problems. The roots of the windthrown trees, however, were severely decayed, including large support roots. The decay was a white, laminated rot with small pits and black zone lines. On the outside of the roots, and occasionally in the wood, were the shoestrings, or rhizomorphs, of Armillariella mellea.

BIOLOGY OF ARMILLARIA ROOT DISEASE

The fungus Armillariella mellea is a parasite on a wide number of hosts, including conifers and hardwoods. In addition to being a parasite, it is a quite effective saprophyte found commonly throughout the forest. Generally, it colonizes dead and dying hardwood host tissue from which it may infect surrounding hardwoods and conifers, primarily those that are under stress.

Although the fungus produces honey-colored, gilled mushrooms in the fall that prolifically produce spores, these spores have not been shown to be effective disseminators of the fungus. However, it appears to be a common inhabitant of wood in forest stands. Once the fungus is established in woody tissue, it spreads underground between hosts by way of root contacts and rhizomorphs - black shoestring-like structures. These rhizomorphs may be on the outside of the root until the tree weakens, whereupon they can successfully invade the cambial region. Advance of the fungus in the tree then occurs primarily as mycelial fans, which are sheets of white fungal material of a rather tough and leathery consistency. Once the fungus grows to the root collar the tree dies.

Although of concern in many areas of the world, observations in California indicate that Armillaria root disease is generally not an active killer, except in close proximity to infected hardwoods. It is common to find it associated with other root diseases, possibly accelerating the rate of the tree mortality.

MANAGEMENT ALTERNATIVES

1. Do Nothing. It is not expected that Armillaria root disease will kill many, if any, commercial trees in the area. The growth impact on infected green trees is unknown. During periods of severe weather conditions, such as heavy rains and high winds, additional windthrow may occur. Some of the natural regeneration may be killed when it contacts buried inoculum, but this should be minimal compared to the amount of regeneration that will occur. Stand productivity will be lower than optimal because of inconsistent stocking levels and tree conditions. The windthrown trees should not result in increased bark beetle activity on surrounding live trees because of the limited number of windthrown trees and the variety of tree species involved.

2. Sanitation/Salvage. Salvage of windthrown trees would capture their volume prior to wood degradation. A sanitation thinning to remove overmature, decadent, and deformed trees in conjunction with a salvage sale would improve the economic benefits of a salvage sale, although it would result in parts of the stand being understocked and parts overstocked. Because of the lack of root disease-associated crown symptoms, no effort to selectively remove Armillariella-infected trees could be attempted. This treatment would promote an uneven-aged stand with natural regeneration occurring in openings. It is not expected that the present impact of root disease on the stand would be altered by this treatment.

3. Regeneration Cut. Long-term productivity and stand conditions would have the greatest opportunity for improvement if the overstory were removed and replaced by either advanced regeneration or by planting. Caution during logging would be required if advanced regeneration is to be retained. Precommercial thinning of thickets and regeneration of openings may also be necessary. Some mortality of regeneration could occur in the root disease center, but this should include only a limited number of seedlings and saplings. Once the new stand reaches 10 to 15 years of age, mortality from Armillaria root disease should not be observed.